IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appl. No. : 09/846,607
Appellant(s) : HARBERS, Gerard, et al.
Filed : 30 April 2001
Title : ASSEMBLY OF A DISPLAY DEVICE AND AN ILLUMINATION SYSTEM

TC/A.U. : 2629
Examiner : XIAO, Ke

Atty. Docket : NL 000222

APPELLANT'S APPEAL BRIEF

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Brief of Appellant follows a Notice of Appeal dated 12 February 2007, appealing the decision dated 13 November 2006 of the Examiner finally rejecting claims 1-7 and 9-20 of the application.

All requisite fees set forth in 37 CFR 1.17(c) for this Brief are hereby authorized to be charged to Deposit Account No. 14-1260.

REAL PARTY IN INTEREST

The real party in interest in this appeal is the assignee of all rights in and to the subject application, Koninklijke Philips Electronics, N.V. of The Netherlands.

RELATED APPEALS AND INTERFERENCES

To the best of the knowledge of the undersigned, no other appeals or interferences are known to Appellants, Appellants' legal representatives, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

STATUS OF CLAIMS

In an amendment dated 1 July 2003, original claims 1-14 were amended, and new claims 15-20 were added. In an amendment dated 2 January 2004, claims 1-12 were further amended. In amendments dated 7 April 2004, 4 October 2004 and 6 April 2005, claims 1, 13 and 14 were further amended, and in the amendment dated 6 April 2005, claim 8 was cancelled. Claims 1-7 and 9-20 now stand finally rejected as set forth in the final Office action dated 13 November 2006, and in the Advisory Action dated 16 January 2007, and are the subject of this appeal.

STATUS OF AMENDMENTS

In response to the final Office action, claims 3, 4, 6 and 9-11 were amended to delete multiple dependencies. All amendments have been entered.

SUMMARY OF THE CLAIMED SUBJECT MATTER

A first aspect of the invention relates to an assembly comprising: (a) a display device provided with a pattern of pixels associated with color filters, and (b) an illumination system for illuminating the display device, the illumination system having a light-emitting panel and at least one light source associated with the light-emitting panel. (specification, page 1, lines 1-6)

More specifically, the light source comprises at least three light-emitting diodes (16R, 16B, 16B) having different light-emission wavelengths, said light-emitting diodes (16R, 16B, 16B) being associated with the color filters (5R, 5G, 5B). In addition, the illumination system is operable to drive the light-emitting diodes (16R, 16B, 16B) to separately control the intensity of light emitted in at least one of the wavelengths and thereby change a color temperature and illumination level of a picture to be displayed by the display device, wherein the light intensity of the light-emitting diodes (16R, 16B, 16B) varies in response to an illumination level of the picture to be displayed by the display device. (specification: page 2, lines 29-31; page 7, lines 5-8; page 10, lines 9-11; page 16, lines 1-11; Figs. 1A and 1B; claim 1)

According to one embodiment of this aspect of the invention, the spectral emission of each of the light-emitting diodes (16R, 16B, 16B) is substantially adapted to a spectrum of one of the color filters (5R, 5G, 5B). (specification, page 3, lines 5-9; claim 2)

According to another embodiment of this aspect of the invention, the light source comprises at least one blue light-emitting diode (16B), at least one green light-emitting diode (16G) and at least one red light-emitting diode (16R), the color filter comprises a blue (5B), a green (5G) and a red (5R) color filter, and in operation, the blue color filter (5B) predominantly passes light originating from the blue light-emitting diode (16B), the green color filter (5G) predominantly passes light originating from the green light-emitting diode (16G) and the red color filter (5R) predominantly passes light originating from the red light-emitting diode (16R). (specification, page 5, line 28 through page 6, line 2; claim 3)

According to another embodiment of this aspect of the invention, at least one of the light-emitting diodes (16R, 16B, 16B) is chosen such that the wavelength associated with a spectral maximum of the light-emitting diodes corresponds to a wavelength associated with a spectral maximum of the corresponding color filter (5R, 5G, 5B) in the visible spectrum. (specification, page 6, lines 6-10; claim 4)

According to another embodiment of this aspect of the invention, the wavelength λ_{led}^{max} associated with the spectral maximum of at least one of the light-emitting diodes (16R, 16B, 16B) and the wavelength λ_{cf}^{max} associated with the spectral maximum of the corresponding color filter (5R, 5G, 5B)

meet the relation: $\left|\lambda_{led}^{\max} - \lambda_{cf}^{\max}\right| \leq 5nm$. (specification, page 6, lines 25-28; claim 5)

According to another embodiment of this aspect of the invention, the spectral bandwidth (FWHM) of the light-emitting diodes (16R, 16B, 16B) lies in a range between 10 ≤ FWHM ≤ 50 nm. (specification, page 6, lines 29-31; claim 6)

According to another embodiment of this aspect of the invention, the spectral bandwidth lies in a range between 15 ≤ FWHM ≤ 30 nm. (specification, page 6, line 31-page 7, line 1; claim 7)

According to another embodiment of this aspect of the invention, the intensity of the light emitted by the light-emitting diodes (16R, 16B, 16B) can be adjusted on a frame-to-frame basis. (specification, page 7, lines 30-32; claim 9)

According to another embodiment of this aspect of the invention, the intensity of the light emitted by the light-emitting diodes (16R, 16B, 16B) can be adjusted for each color on a frame-to-frame basis. (specification, page 8, lines 1-3; claim 10)

According to another embodiment of this aspect of the invention, each one of the light-emitting diodes (16R, 16B, 16B) has a luminous flux of at least five lumens. (specification, page 8, lines 17 and 18; claim 11)

According to another embodiment of this aspect of the invention, the light-emitting diodes (16R, 16B, 16B) are mounted on a printed circuit board. (specification, page 11, lines 10 and 11; claim 12)

According to another embodiment of this aspect of the invention, the picture to be displayed by the display device is associated with one of a plurality of emission standards, each

emission standard associated with a standardized color triangle; and the illumination system is operable to tune the light-emitting diodes such that the display device displays the picture in accordance with the standardized color triangle of the emission standard associated with the picture. (specification, page 4, lines 9-17 and 24-29; page 15, lines 6-18; claim 15)

According to another embodiment of this aspect of the invention, the picture comprises one of a plurality of pictures, the plurality of pictures associated with different emission standards; and the illumination system is operable to tune the light-emitting diodes such that the display device displays each of the pictures in accordance with the standardized color triangle of the emission standard associated with each of pictures. (specification, page 4, lines 9-17 and 24-29; claim 16)

According to another embodiment of this aspect of the invention, the plurality of emission standards comprise National Television Standards Committee (NTSC), European Broadcasting Union (EBU), and High Definition Television (HDTV) emission standards. (specification, page 4, lines 16 and 17 and 24-29; claim 17)

According to another aspect of the invention, a display device for use with an illumination system comprises: (a) a liquid crystal display panel (4) comprising a plurality of liquid crystal elements (4A, 4A', 4B, 4B') operable to selectively allow passage of light from the illumination system; and (b) at least one color filter (5) operable to filter the light allowed to pass through one or more of the liquid crystal elements (4A, 4A', 4B, 4B') to produce one or more pictures; wherein the illumination system drives at least

three light-emitting diodes (16R, 16G, 16B) having different light-emission wavelengths to separately control the intensity of light emitted in at least one of said different light emission wavelengths and thereby change a color temperature and illumination level of the one or more pictures, wherein an intensity of light emitted by the light-emitting diodes (16R, 16G, 16B) varies in response to an illumination level of the picture to be displayed by the display device. (specification, page 16, lines 4-11; Fig. 1B; claim 13)

According to another embodiment of this aspect of the invention, the at least one color filter (5) comprises blue (5B), green (5G), and red (5R) color filters. (specification, page 12, lines 25 and 26; Fig. 1B; claim 18)

According to a third aspect of the invention, an illumination system is provided for use with a display device, the illumination system comprising: (a) a light-emitting panel (11); (b) at least one light source (16) associated with the light-emitting panel (11), the at least one light source (16) comprising at least three light-emitting diodes (16R, 16G, 16B) having different light-emission wavelengths, the light-emitting diodes (16R, 16G, 16B) associated with color filters (5R, 5G, 5B) in the display device; and (c) a controller (19, 8) operable to drive the at least three light-emitting diodes (16R, 16G, 16B) to separately control the intensity of light emitted in at least one of said different light emission wavelengths and thereby change a color temperature and illumination level of a picture to be displayed by the display device, wherein an intensity of light emitted by the light-emitting diodes (16R, 16G, 16B) varies in response to an illumination level of the picture to be displayed by the

display device. (specification, page 16, lines 4-19; Fig. 1B; claim 14)

According to another embodiment of this aspect of the invention, the picture to be displayed by the display device is associated with one of a plurality of emission standards, each emission standard associated with a standardized color triangle; and the controller (19, 8) is operable to tune the light-emitting diodes (16R, 16G, 16B) such that the display device displays the picture in accordance with the standardized color triangle of the emission standard associated with the picture. (specification, page 4, lines 9-17 and 24-29; Fig. 1A; claim 19)

According to another embodiment of this aspect of the invention, the picture comprises one of a plurality of pictures, the plurality of pictures associated with different emission standards; and the controller (8, 19) is operable to tune the light-emitting diodes (16R, 16G, 16B) such that the display device displays each of the pictures in accordance with the standardized color triangle of the emission standard associated with each of pictures. (specification, page 4, lines 9-17 and 24-29; Fig. 1A; claim 20)

GROUND(S) OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are:

1. Claims 1-5, 9, 10, 12-14 and 18 are rejected under 35 USC 103(a) as being unpatentable over Uehara et al. (US 4,772,885) (herein 'Uehara') in view of Stewart et al. (US 5,337,068) (herein 'Stewart');

2. Claims 6, 7, 11, 15-17, 19 and 20 are rejected under 35 USC 103(a) as being unpatentable over Uehara and Stewart as applied above, and further in view of Appellant's admitted prior art (AAPA).

ARGUMENT

1. Are claims 1-5, 9, 10, 12-14 and 18 unpatentable under 35 USC 103(a) over Uehara in view of Stewart?

Claims 1-5, 9, 10, 12-14 and 18 are rejected under 35 USC 103(a) as being unpatentable over Uehara in view of Stewart.

Claims 1, 13 and 14

Regarding claims 1, 13 and 14, Uehara discloses a liquid crystal color display device which includes a liquid crystal image-generating unit (35) and an illumination unit (41) which may be combined with a color filter (63). In the embodiment of Figs. 3 and 4, the light of the illumination unit is generated using electroluminescent materials.

The color filter 63 is used to produce color images of good color balance through adjustments to the hues or dominant wavelengths, the saturations, the purities and the brightnesses of the colors R, G, B of the light-emitting pixel layer elements. See col. 4, lines 53-65.

Uehara does not disclose the use of LEDs as light-generating elements, nor does Uehara disclose driving at least three light-generating elements to separately control the intensity of light emitted by at least one of the elements, and

thereby change a color temperature and illumination level of a picture to be displayed by the display device, as called for by claims 1, 13 and 14.

Moreover, Uehara does not teach varying the intensity of light emitted by the light-emitting diodes in response to an illumination level of the picture to be displayed by the display device, as called for by claims 1, 13 and 14.

Stewart discloses a field-sequential display system with a back-lit LCD image panel. The LCD image panel is backlit by a bank of red, green and blue fluorescent lamps.

In a field-sequential display system, a full color display is created by sequentially flashing red, green and blue components of the full color image at a frequency which causes the perception by the viewer of a merging of the sequential color components into a full color image.

This field-sequential display is backlit by flashing red, green and blue components of the backlight synchronously with the flashing of the red, green and blue image components, so that a full color backlit display is produced without degradation of the color purity of the image.

Stewart also discloses changing the duty cycle of the fluorescent lamps to momentarily highlight or dim the display, or to change the relative duty cycles of the red, green and blue lamps to change the color balance of the display. Stewart also discloses adjusting the flash duration of individual lamps to correct for intensity and color nonuniformities. See col. 9, lines 35-47.

Stewart also discloses the use of alternate light sources, such as cathodoluminescent or electroluminescent sources. See col. 13, lines 30 and 31.

However, Stewart does not disclose LEDs, nor driving at least three LEDs to separately control the intensity of light emitted by at least one of the LEDs, and thereby change a color temperature and illumination level of a picture to be displayed by the display device, as called for by claim 1.

Moreover, Stewart does not teach varying the intensity of light emitted by the light-emitting diodes in response to an illumination level of the picture to be displayed by the display device, as called for by claims 1, 13 and 14.

The Examiner has stated that it would have been obvious to add individual control of LEDs as taught by Stewart to the display device of Uehare in order to allow for dynamic color balancing.

However, Stewart does not teach dynamic color balancing, that is, Stewart does not teach varying either the duty cycle or the flash duration of the lamps in response to an illumination level of the picture to be displayed, as called for by claims 1, 13 and 14.

Moreover, since Uehara's system is not a field-sequential system, Stewart's teaching of changing the duty cycle or flash duration of the lamps would not be applicable to Uehara's system. That is, Uehara relies on a matrix of intermixed red, green and blue pixels to produce a full color image, not on the sequential flashing of red, green and blue fields. Thus, Uehara relies on the spatial integration of red, green and blue pixels by the viewer, while Stewart relies on the temporal integration of red, green and blue fields by the viewer.

Thus, Uehara uses a backlight which is constantly on, illuminating the LCD panel with a uniform level of

illumination, whereas Stewart's backlight is flashing on and off synchronously with the flashing on and off of the component color fields.

Thus, Stewart's methods of varying the duty cycle and flash duration are simply inapplicable to Uehara's system, and the skilled artisan would not be led to make the modification urged by the Examiner.

In response to Appellant's previous argument that the references fail to teach "changing a color temperature and illumination level of a picture to be displayed by the display device, wherein an intensity of light emitted by the light-emitting diodes varies in response to an illumination level of the picture", the Examiner has responded that Stewart clearly teaches that backlights can be adjusted according to the illumination level of the picture.

However, Stewart does not teach varying the intensity of the light-emitting units, as called for by claim 1. In fact, the intensity of the fluorescent lamps cannot be varied. A fluorescent lamp is either on or off. Thus, only the duty cycle and flash duration of such a lamp can be varied.

A unique characteristic of LEDs is that their intensities can be individually varied simply by varying the current to the LEDs, enabling more control over the quality of illumination than a system having light-generating units with on/off capability, such as the fluorescent lamps used by Stewart.

Claims 2-4

Regarding claims 2-4, both Uehara and Stewart disclose the use of electroluminescent materials, but neither

reference teaches or suggests the use of LEDs as the light-generating units.

Claim 5

Regarding claim 5, neither reference teaches or suggests the use of LEDs as light-generating units, nor the claimed relationship.

Claims 9 and 10

Regarding claims 9 and 10, neither reference teaches that the intensity of the LED can be adjusted on a frame-to-frame basis. As already stated, neither reference teaches or suggests the use of LEDs as light-generating units, nor adjusting the intensity of any light-generating unit.

Accordingly, claims 1-5, 9, 10, 12-14 and 18 are patentable over Uehara in view of Stewart, and the rejection is in error and should be reversed.

2. Are claims 6, 7, 11, 15-17, 19 and 20 unpatentable under 35 USC 103(a) over Uehara and Stewart as applied above, and further in view of AAPA?

Claims 6, 7, 11, 15-17, 19 and 20 are rejected under 35 USC 103(a) as being unpatentable over Uehara and Stewart as applied above, and further in view of AAPA.

Claims 6 and 7

Regarding claims 6 and 7, the Examiner relies on Appellant's admitted prior art (p. 3, paras. [0036] and [0037]) to show that such characteristics are well known.

However, Appellant can find no statement in the admitted prior art regarding specific values of bandwidth of LEDs. If the Examiner is referring to EP0915363, cited on page 2 of the specification, Appellant could find no statement therein regarding the spectral bandwidth of LEDs. Even if such a statement exists, claims 6 and 7 are patentable by virtue of their dependency.

Claim 11

Regarding claim 11, Appellant can find no statement in the admitted prior art regarding specific values of lumens of LEDs. If the Examiner is referring to EP0915363, Appellant could find no statement therein regarding lumen values of LEDs. Even if such a statement exists, claim 11 is patentable by virtue of its dependency.

Claims 15-17, 19 and 20

Regarding claims 15-17, 19 and 20, the Examiner has stated that it would have been obvious to use any of the known standards in the devices of Uehara and Stewart in order to broaden their marketability.

However, Appellant is not claiming to use any of the known standards, but rather is claiming that the illumination system is operable to tune the light-emitting diodes such that the display device displays each of the pictures in accordance with the standardized color triangle of the emission standard

associated with each of the pictures. (claim 16)

This concept is not embodied in the mere knowledge that different standards exist, nor would it have been obvious in view of this knowledge to provide a system capable of displaying pictures according to different standards. This capability is possible only because Appellant's illumination system is dynamically tunable, and this capability is due to the ability to independently control the intensities of the individual LEDs.

In order for a combination of references to succeed in a rejection under section 103, at least one of the references must contain a suggestion which would motivate the skilled artisan to make the substitution which would result in the invention. In the present case, the mere knowledge of different standards is insufficient to motivate the skilled artisan to modify either Stewart or Uehare to arrive at the claimed structure.

It is only with the aid of hindsight gained from Appellant's own teachings that the invention can be appreciated, and such hindsight is not permitted in judging obviousness under section 103.

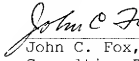
Accordingly, claims 6, 7, 11, 15-17, 19 and 20 are patentable over Uehara and Stewart in view of AAPA, and the rejection is in error and should be reversed.

CONCLUSION

In view of the foregoing, Appellant respectfully requests that the Board reverse the rejection of record, and direct the Examiner to allow all of the pending claims, and to

otherwise find the application to be in condition for allowance.

Respectfully submitted,



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APPENDIX

CLAIMS ON APPEAL

1. An assembly comprising:

a display device provided with a pattern of pixels associated with color filters, and

an illumination system for illuminating the display device,

said illumination system comprising a light-emitting panel and at least one light source, said light source being associated with the light-emitting panel,

the light source comprising at least three light-emitting diodes having different light-emission wavelengths,

said light-emitting diodes being associated with the color filters,

said illumination system operable to drive the at least three light-emitting diodes to separately control the intensity of light emitted in at least one of said different light emission wavelengths and thereby change a color temperature and illumination level of a picture to be displayed by the display device, wherein an intensity of light emitted by the light-emitting diodes varies in response to an illumination level of the picture to be displayed by the display device.

2. An assembly as claimed in claim 1, wherein:

the light source comprises three light-emitting diodes having different light-emission wavelengths, and

the color filter comprises three color filters,

a spectral emission of each one of the three light-emitting diodes being substantially adapted to a spectrum of one of the color filters.

3. An assembly as claimed in claim 1, wherein:

the light source comprises at least one blue light-emitting diode, at least one green light-emitting diode and at least one red light-emitting diode,

the color filter comprises a blue, a green and a red color filter, and

in operation, the blue color filter predominantly passes light originating from the blue light-emitting diode, the green color filter predominantly passes light originating from the green light-emitting diode and the red color filter predominantly passes light originating from the red light-emitting diode.

4. An assembly as claimed in claim 1, wherein at least one of the light-emitting diodes is chosen such that the wavelength associated with a spectral maximum of the light-emitting diodes corresponds to a wavelength associated with a spectral maximum of the corresponding color filter in the visible spectrum.

5. An assembly as claimed in claim 4, wherein the wavelength λ_{led}^{max} associated with the spectral maximum of at least one of the light-emitting diodes and the wavelength λ_{cf}^{max} associated with the spectral maximum of the corresponding color filter meet the relation: $\left|\lambda_{led}^{max} - \lambda_{cf}^{max}\right| \leq 5nm$.

6. An assembly as claimed in claim 1, wherein a spectral bandwidth (FWHM) of the light-emitting diodes lies in a range between $10 \leq$ FWHM ≤ 50 nm.

7. An assembly as claimed in claim 6, wherein the spectral bandwidth lies in a range between $15 \leq$ FWHM ≤ 30 nm.

9. An assembly as claimed in claim 1, wherein the intensity of the light emitted by the light-emitting diodes can be adjusted on a frame-to-frame basis.

10. An assembly as claimed in claim 1, wherein the intensity of the light emitted by the light-emitting diodes can be adjusted for each color on a frame-to-frame basis.

11. An assembly as claimed in claim, wherein each one of the light-emitting diodes has a luminous flux of at least five lumens.

12. An assembly as claimed in claim 11, wherein the light-emitting diodes are mounted on a printed circuit board.

13. A display device for use with an illumination system, comprising:

a liquid crystal display panel comprising a plurality of liquid crystal elements operable to selectively allow passage of light from the illumination system; and

at least one color filter operable to filter the light allowed to pass through one or more of the liquid crystal elements to produce one or more pictures;

wherein the illumination system drives at least three light-emitting diodes having different light-emission wavelengths to separately control the intensity of light emitted in at least one of said different light emission wavelengths and thereby change a color temperature and illumination level of the one or more pictures, wherein an intensity of light emitted by the light-emitting diodes varies in response to an illumination level of the picture to be displayed by the display device.

14. An illumination system for use with a display device, comprising:

a light-emitting panel;

at least one light source associated with the light-emitting panel, the at least one light source comprising at least three light-emitting diodes having different light-emission wavelengths, the light-emitting diodes associated with color filters in the display device; and

a controller operable to drive the at least three light-emitting diodes to separately control the intensity of light emitted in at least one of said different light emission wavelengths and thereby change a color temperature and illumination level of a picture to be displayed by the display device, wherein an intensity of light emitted by the light-emitting diodes varies in response to an illumination level of the picture to be displayed by the display device.

15. An assembly as claimed in claim 1, wherein:

the picture to be displayed by the display device is associated with one of a plurality of emission standards, each emission standard associated with a standardized color

triangle; and

the illumination system is operable to tune the light-emitting diodes such that the display device displays the picture in accordance with the standardized color triangle of the emission standard associated with the picture.

16. An assembly as claimed in claim 15, wherein:

the picture comprises one of a plurality of pictures, the plurality of pictures associated with different emission standards; and

the illumination system is operable to tune the light-emitting diodes such that the display device displays each of the pictures in accordance with the standardized color triangle of the emission standard associated with each of pictures.

17. An assembly as claimed in claim 15, wherein the plurality of emission standards comprise National Television Standards Committee (NTSC), European Broadcasting Union (EBU), and High Definition Television (HDTV) emission standards.

18. A display device as claimed in claim 13, wherein the at least one color filter comprises blue, green, and red color filters.

19. An illumination system as claimed in claim 14, wherein:

the picture to be displayed by the display device is associated with one of a plurality of emission standards, each emission standard associated with a standardized color triangle; and

the controller is operable to tune the light-emitting

diodes such that the display device displays the picture in accordance with the standardized color triangle of the emission standard associated with the picture.

20. An illumination system as claimed in claim 19, wherein:

the picture comprises one of a plurality of pictures, the plurality of pictures associated with different emission standards; and

the controller is operable to tune the light-emitting diodes such that the display device displays each of the pictures in accordance with the standardized color triangle of the emission standard associated with each of pictures.

EVIDENCE APPENDIX

(none)

RELATED PROCEEDINGS APPENDIX

(none)